

## TITLE PAGE

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Full Title: Reduction of injection-related risk behaviors following emergency implementation of a syringe services program during an HIV outbreak

Running head: Risk behaviors following syringe exchange

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**ABSTRACT:**

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**Objective:** To describe injection-related HIV risk behaviors pre- and post-implementation of an emergency syringe services program (SSP) in Scott County, Indiana, following an HIV outbreak among persons who inject drugs (PWID).

**Design:** Mixed methods retrospective pre-post intervention analysis.

**Methods:** We analyzed routine SSP program data collected at first and most recent visit among clients with  $\geq 2$  visits,  $\geq 7$  days apart from April 4 to August 30, 2015 to quantify changes in injection-related risk behaviors. We also analyzed qualitative data collected from 56 PWID recruited in Scott County to understand factors contributing to these behaviors.

**Results:** SSP clients included in our analysis (n=148, 62% of all SSP clients) reported significant ( $p < 0.001$ ) reductions over a median 10 weeks (range 1-23) in syringe sharing to inject (18% to 2%) and divide drugs (19% to 4%), sharing other injection equipment (e.g., cookers) (24% to 5%), and number of uses of the same syringe (2 [IQR: 1-4] to 1 [IQR: 1-1]). Qualitative study participants described access to sterile syringes and safer injection education through the SSP, as explanatory factors for these reductions. Injection frequency findings were mixed, but overall suggested no change. The number of syringes returned by SSP clients increased from 0 at first visit to median 57. All qualitative study participants reported using sharps containers provided by the SSP.

**Conclusions:** Analyses of an SSP program and in-depth qualitative interview data showed rapid reduction of injection-related HIV risk behaviors among PWID post-SSP implementation. Sterile syringe access as part of comprehensive HIV prevention is an important tool to control and prevent HIV outbreaks.

**KEY WORDS:** syringe-exchange programs, outbreaks, HIV, risk behavior, syringe-sharing, risk reduction behavior

**BACKGROUND:**

In the United States (US), the proportion of diagnosed HIV infections attributable to injection drug use declined from an estimated 8.9% in 2009 to 6.0% in 2014 <sup>1,2</sup>. Nonetheless, increases in incidence of acute hepatitis C infection and opioid-related overdoses and deaths in the US suggest an overall increase in injection drug use <sup>3-5</sup>. Injection-related behaviors including multi-person sharing of syringes to inject or to divide drugs, and sharing of other injection equipment such as cookers, water, or cotton can increase risk of HIV transmission <sup>6,7,8</sup>. Consequently, there is potential for increased HIV transmission in parts of the US where effective HIV prevention interventions, including syringe services programs (SSPs), for persons who inject drugs (PWID) are limited or lacking.

SSPs facilitate safe disposal of used syringes and provide free sterile syringes and risk reduction education to PWID, and can provide or refer clients to other harm reduction interventions, medical and mental health care, and social services. By reducing injection-related risk behaviors, SSPs subsequently reduce transmission of infectious diseases such as HIV and hepatitis C virus (HCV) among SSP clients, as well as the broader community <sup>9</sup>. Studies conducted over the past several decades have found SSPs to be effective and cost-effective in reducing HIV transmission risk without increasing negative consequences in the communities in which they operate <sup>10,11</sup>. Studies also show that SSPs protect the public and first responders by providing safe needle disposal <sup>12,13</sup> and provide an optimal setting for overdose prevention, including training on naloxone, a life-saving medication that reverses the effects of opioid overdose <sup>14</sup>. Nonetheless, coverage of SSPs in the US remains low, particularly in non-urban areas <sup>15</sup>.

In late 2014, Scott County in southeastern Indiana experienced the largest HIV outbreak among PWID in a non-urban setting in the US. Between November 18, 2014 and November 1, 2015, 181 persons received a diagnosis of HIV in a small rural county (population 24,000), where only 5 HIV infections had been diagnosed from 2004 through 2013.<sup>16</sup> All infections were linked to injection of a prescription opioid<sup>16</sup>. The HIV outbreak required a large, multi-faceted emergency response to control and prevent new infections. This effort was supported, in part, by the Indiana Governor's declaration of a public health emergency on March 26, 2015, which allocated necessary resources and personnel to respond to the outbreak<sup>17</sup>. This emergency declaration also allowed the establishment of the first legal SSP in the state, and the first in a non-urban area in the US in response to an HIV outbreak. Given that opioid use and drug injection have been increasing in many non-urban areas, there is a great need to better understand SSP program characteristics and the unique barriers and facilitators to accessing services that exist in non-urban settings.

The Scott County SSP was established on April 4, 2015, within 1 week of the Indiana Governor declaring a public health emergency<sup>17</sup>. County residents ages  $\geq 14$  years are eligible to enroll. The SSP offers anonymous needs-based syringe exchange, which allows clients to receive a number of sterile syringes based on the number of syringes returned and the reported frequency of daily injections<sup>18</sup>. A 7-day supply of sterile equipment is provided, along with wound care kits and harm reduction counseling. The SSP provides integrated and comprehensive harm reduction services, including on-site HIV and HCV testing and referral to local health care providers to ensure timely access to substance use disorder treatment and HIV antiretroviral therapy (ART) or

pre-exposure prophylaxis (PrEP). During the timeframe of this analysis, clients access SSP services 5-days per week at a fixed, storefront location and via mobile outreach.

We used routinely collected program data from the Scott County SSP and data from a qualitative study in the non-urban community in which the SSP was established in response to an HIV outbreak, to compare injection-related risk behaviors and perceptions of risk before and after the emergency implementation of the SSP. These findings could inform HIV prevention efforts in other jurisdictions that are preparing or expanding SSPs as part of a comprehensive approach to addressing injection-related harms.

**METHODS:**

A mixed-methods design, using quantitative program data and qualitative study data collected in Scott County, was used to understand changes in risk behaviors and risk perceptions among PWID.

***Quantitative program data measures and analysis***

Routinely collected data from the Scott County SSP database were available for all clients from the date the SSP was established, April 4, 2015 to August 30, 2015. To enable comparison across multiple visits to the SSP, data for this analysis were limited to clients with at least 2 visits, at least 7 days apart. At each SSP visit, staff used a standard form to collect data on self-reported current injection-related risk behaviors, number of sterile syringes dispensed, and estimated number of syringes returned for safe disposal. Behavioral measures included number of times the same needle was used for injection and syringe sharing to inject or divide drugs, or sharing other injection equipment. The maximum reported number of injections per day was assessed by SSP staff as a proxy for syringe need; this measure was used by SSP staff to calculate the number of sterile syringes dispensed to each client. A unique identifier was assigned to each SSP client to track program data over time without collecting personal identifying information (e.g., names). We identified the first and most recent visit for each client and summarized injection-related risk behaviors, and counts of syringes provided and returned, at these two time points.

We tested for statistical differences for categorical and continuous variables, accounting for within-person correlation, using the McNemar's chi-square and Wilcoxon signed rank tests, respectively. Statistical analyses were conducted using SAS 9.3 (SAS Institute, Cary, NC).

Analysis of SSP program data was approved by the Centers for Disease Control and Prevention



(CDC) through a determination in accordance with federal human subjects protection regulations and CDC policies and procedures that did not require review by an institutional review board<sup>19,20</sup>.

### *Qualitative study data measures and analysis*

Qualitative data were collected during a research study conducted from July to September, 2015 to identify factors that may have facilitated rapid HIV transmission in Scott County. Purposeful sampling was conducted in the community served by the SSP through multiple methods to ensure a wide cross-section of the PWID population and included service provider referrals, peer referrals, and street recruitment. Persons were eligible to participate if they resided in Scott County, were ages  $\geq 18$  years, reported injection drug use in the previous 12 months and provided informed consent. Past-year injection drug use was assessed by observing recent physical marks of injection and confirmed during the in-depth interviews that described injection practices. The interviews were anonymous; no names or other identifying information were collected.

Initially, four focus groups (FGs) were conducted to assess community perceptions around injection practices and evaluate SSP access and utility. Preliminary findings from FGs informed final revisions to the interview guide for private interviews (PIs). PIs were conducted approximately 1 month later to assess individual-level behaviors, including SSP use, and to explore emerging topics raised in FGs. In total, six participants interviewed in FGs also participated in PIs.

Study staff used semi-structured interview guides to conduct FGs and PIs. Relevant FG questioning included, “How have people’s drug injection practices changed, if at all, since you became aware of HIV in the community? What are they doing differently? What’s the same?” A

short anonymous demographic survey was administered after the FGs to collect information on age, race/ethnicity and other background characteristics. Relevant PI questions assessed the last time the participants injected and how that differed from injection practices before knowledge of HIV in the community. Specific probes further assessed injection frequency, syringe disposal practices, and syringe and other injection equipment sharing practices. Demographic and background information to characterize the PI sample were collected through the eligibility screener and during interviews.

FGs and PIs were digitally recorded, transcribed, cross-checked, and prepared for descriptive analyses using NVivo 10 software. To enhance rigor, two researchers analyzed data by independently reviewing transcripts and then comparing notes for inter-coder agreement prior to coding data. Transcripts were coded into broad categories and then subcoded into refined categories. Results captured descriptions of changes in injection risk behaviors over time after the HIV outbreak and SSP. We present participant direct quotes denoted by a unique anonymous code that indicates the type of interview (FG or PI) and a unique, sequential number (e.g., PI12).

Human subjects and ethics review and approval were received for the qualitative study from Institutional Review Boards at CDC and Indiana University.

## RESULTS

### SSP client and qualitative study participant characteristics

The SSP enrolled 237 clients between April 4, 2015 and August 30, 2015; 148 (62%) had documentation of at least two visits that were at least 7 days apart and were included in our analysis (Table 1). These 148 clients had a total of 854 visits (median: 4; range: 2-27) and total of 1,479 weeks (median 10; range 1-23) between the first and most recent visit. This corresponds to an overall rate of 0.58 visit per person-week across clients (854 visits per 1,479 person-weeks). The median age of clients was 34 years (range: 18-63 years), 56% were male, and 98% were non-Hispanic white. The majority (89%) of SSP clients at their first visit reported injecting OPANA® ER with INTAC®, an FDA-approved proprietary crush-resistant formulation of extended-release oxymorphone (hereinafter Opana) (Table 1). Most (84%) SSP clients reported having been tested for HIV at their first visit; data on HIV/HCV status was not systematically collected.

A total of 56 qualitative study participants (31 from FGs, 25 from PIs) were included in the qualitative data analysis (Table 1). These participants had a similar distribution of race, gender and age to SSP clients included in the analysis; with the exception of FG participants, who were more commonly female (52% versus 44%). The majority of PI participants (92%) and FG participants (97%) reported primarily injecting Opana within the previous 12 months. All PI participants and 97% of FG participants reported being tested for HIV. Compared to PI participants, a larger percentage of FG participants reported HCV infection (93% versus 84%) and HIV infection (59% versus 40%). Most qualitative study participants were enrolled in the SSP (76% of PI and 90% of FG participants).

## Sharing of syringes and other injection equipment

At first SSP visit, 18% of clients reported sharing syringes to inject, 19% reported sharing syringes to divide drugs, and 24% reported sharing other injection equipment, such as cookers, filters and water. At most recent visit, all three sharing practices had decreased significantly, but still were reported by some SSP clients (Table 2).

*We'd put water in a cup, and everybody would use the same water and can...my boyfriend, friends, family, cousins, sister. If I was sick, had a pill, and I didn't have a needle, I would use whoever's was there...There's [also] been a couple times I've bought used needles and, used bleach to rinse them out...I've used needles before that the plungers were broke, and we'd melt them back together to use...I'm sure the person I was sharing with probably shared with everybody too (PI06).*

All qualitative study participants reported high risk sharing practices of syringes and other injection equipment prior to their awareness of the HIV outbreak and presence of the SSP, whether in reference to themselves and/or others (Table 3a). Participants explained that sharing was widespread because of extremely limited access to new syringes, limited knowledge that sharing other injection equipment (independent of the syringe) was a risk factor for HIV/HCV, and willingness to inject with a discarded syringe when no other syringe was available.

Participants also reported sharing syringes and other injection equipment when an Opana pill was shared with others. Practices included sharing previously used syringes to divide drugs (backloading); sharing syringes to inject; and sharing cookers, water, and filters. When backloading, one person uses one syringe to draw up drug solution from a shared cooker and

then squirts the drug into the back of other people's syringes. When sharing syringes to inject, one person injects with a syringe and passes it to other people to inject. When sharing other injection equipment, multiple people insert their syringes into a shared cooker to draw up drug solution and inject. Five participants reported never sharing syringes to inject or divide drugs prior to the SSP; two were insulin dependent diabetics with syringe prescriptions, one predominantly used methamphetamine, and two were a couple who lived outside the town where most PWID lived in Scott County, possibly precluding sharing with others.

Participants reduced their injection risk behaviors after the SSP (Table 3b), noting "it's not hard to find a syringe anymore", "since the needle program's been out" and that "I give it [a needle] to them" if someone is without a new syringe. As a result, participants explained there was no need to "use after nobody" and that "you only use a needle once".

Participants also reported ongoing sharing of pill solutions after the HIV outbreak and the SSP, but dividing drugs in ways that minimized HIV/HCV risk (Table 3b). For example, when backloading, participants reported using a sterile syringe to prepare the drug solution and squirt solution into each person's sterile syringe. Additionally, participants reported when a pill was prepared in one cooker and drawn up by multiple people, only sterile syringe was used. "Dirty needles" never went in the cooker.

A few participants reported continued syringe sharing that may pose HIV/HCV risk (Table 3c). In two cases, the participants with HIV shared with another person with HIV. One represented regular practice and the other represented one-time sharing fueled by lack of a sterile syringe; in

both cases, an exception seemed to be made because of HIV-positive sero-concordance. FG3 participants reported people with HIV more commonly shared with each other because they did not care that they were sharing or believed their HIV medications prevent HIV transmission. One HIV-negative participant reported sharing syringes regularly with his wife who was also HIV-negative.

### **Injection frequency and syringes dispensed**

The average number of daily injections SSP clients reported increased between their first and most recent visits (5 times per day [IQR: 3-9] versus 9 times per day [IQR: 5-15],  $p < 0.001$ ). Similarly, the number of sterile syringes dispensed to clients, (distributed based on self-report of frequency of injection), increased between the first and most recent visit (Table 2). However, qualitative findings did not support increased frequency of injection or increased drug use.

*I was [injecting] anywhere from four to six times a day (PI12).*

Daily injection frequency was explored in PIs, but not FGs (Table 4a) and the findings suggested no change or decrease in frequency of injection during the study period. Most who injected Opana did so daily and more than once per day. Those who injected other drugs (e.g. heroin, methamphetamine), did so once or twice a week. When asked how the presence of the SSP and HIV in their community affected injection practices, almost all participants reported no change in injection frequency per day. One participant reported increased injection frequency due to increasing drug dependence over time. Two reported decreased injection frequency in an effort

to eventually stop using drugs. Three participants had stopped using any drugs and were not injecting when interviewed (Table 1).

In response to a question about satisfaction with the number of syringes received, FG1 participants explained the increases in the number of syringes dispensed per-client since SSP enrollment and that this was due to reduction in syringe reuse by SSP clients over time.

One participant (PI21) described early confusion about how to report frequency of injection per day to SSP staff due to the overall high frequency of injection per day (Table 4a).

### **Number of syringes returned**

The number of used syringes clients returned to the SSP for safe disposal increased from a median of 0 syringes (interquartile range [IQR]: 0-35) at first visit, to a median of 57 syringes (28-105) at the most recent visit.

*[Someone] brought me the big containers that had like 200 needles in them and asked me, can you give these to the health department? They could throw them out in the road, the ditch, lying out in the country somewhere, but they didn't... I said yeah. I'll give them back and I did. I don't want somebody to get hurt on them. Every now and then [I still see needles on the street] but, back then, before [the SSP] came around, yeah you could see needles lying everywhere (PI02).*

Exact numbers of syringes returned were not reported in qualitative data. Table 4b,c shows general findings about syringe disposal before and after the SSP. Nearly all qualitative study participants commented generally about fewer needles on the ground and a much “cleaner” community since availability of SSP disposal containers (Table 4b). Participants mentioned it was common to throw syringes on the streets and see discarded needles everywhere prior to the

SSP. All participants reported using containers for safe disposal post SSP, whether enrolled in the SSP and using their own container or using someone else's.

A few FG participants suggested there were still people in the community throwing syringes on the ground. Only one of all the qualitative participants perceived the community was worse in terms of syringes on the ground since the SSP and claimed to “find them in his yard twice as bad now” (Table 4c).

### **Reusing the same syringe**

The number of times SSP clients used the same syringe decreased from 2 times (IQR: 1-4) to 1 time (IQR: 1-1) between first and most recent visit (Table 2).

*I'd keep a needle for 4 or 5 weeks. And, the needle would have no numbers on it. This part would be bent, it would be hard to even get in my skin. I would use it, and use it, and use it until it broke*  
*Now, I won't [reuse]. I use it one time before I throw it away (PI11).*

All qualitative study participants reported that multiple reuse of syringes prior to the HIV outbreak was very common in the community (Table 5a). Similar to SSP clients, qualitative study participants reported decreased reuse post-SSP (Table 5b); with some instances of reuse (Table 3c). Explanations for reuse post-SSP included lack of access to sterile syringes due to SSP non-enrollment, failure to visit the SSP to resupply, missing a visit on the SSP mobile outreach van, preference for a slightly duller syringe, and reuse of the same syringe if injecting more than once from the same pill solution.



## DISCUSSION

To our knowledge, the Scott County SSP is the first example of an SSP implemented emergently to control an outbreak of HIV among PWID in a non-urban setting in the US. Using both quantitative and qualitative data enhanced our ability to describe and understand behavior change among PWID in this community<sup>21,22</sup>. Our analysis demonstrates rapid reduction in injection-related risk behaviors following SSP implementation, including an 88% reduction in syringe sharing to inject, a 79% reduction in syringe sharing to divide drugs (backloading), and an 81% reduction in sharing of other injection equipment such as cookers or filters. These findings are consistent with those reported by SSPs implemented in non-outbreak settings<sup>23-26</sup>.

We found low percentages of injection-related risk behaviors reported by SSP clients at their first visit to the SSP; only 18% reported sharing syringes to inject at enrollment. In comparison, among PWID interviewed across 20 large cities in the US, 33% reported sharing syringes to inject, 60% reported sharing syringes to divide drugs, and 57% reported sharing other injection equipment in the past 12 months<sup>27</sup>. Our qualitative findings and information reported by PWID during contact tracing conducted during the outbreak response<sup>16</sup> suggested higher percentages of injection equipment sharing prior to the presence of the SSP. Similarly, injection frequency and syringe reuse prior to their awareness of the HIV outbreak as reported by participants in our qualitative study were much higher than reported by SSP clients at enrollment to SSP. A possible explanation for these lower than expected injection risk behaviors reported by SSP clients is that intense HIV case investigations, contact tracing, and public media campaigns were conducted during several months before the SSP opened on April 4, 2015<sup>16</sup>. As a result, some SSP clients

may have reduced injection-related risk behaviors by the time they enrolled in the SSP.

Qualitative participants were asked about injection practices before becoming aware of HIV in their community, and therefore may better represent baseline behavior.

Some SSP clients and qualitative study participants reported occasionally reusing and sharing syringes and other injection equipment post-SSP implementation. Syringe reuse without sharing can cause harm through increased risk of soft tissue infections, endocarditis, collapsed veins, and embedded broken needle tips<sup>28-30</sup>. Reuse of syringes, especially within the context of sharing, can cross-contaminate syringes. Our qualitative results suggest pill sharing among multiple people remains common post-SSP; this poses a prevention challenge as pill sharing necessitates sharing of cookers, filters and drug solution. Even when SSP staff provide adequate sterile syringes and supplies, education on safer injection, and emphasize the importance of not sharing and using sterile equipment for each injection, some sharing may continue that is related to sharing pills.

It has been well established that SSPs do not increase drug use<sup>10,11</sup> and our qualitative interviews indicated mostly no change or decreases in injection frequency. Some participants achieved abstinence. Why then did analyses of the SSP client data appear to indicate an increase in participants' frequency of injection during the study period? There are at least two reasons. First, the injection frequency question was asked by SSP staff to determine how many syringes the client would need for the next seven days. None of the SSP staff had previously operated an SSP, which was established as an emergency measure in a community where SSPs were previously illegal and in which the extent of injection was extremely, perhaps unprecedentedly high. As illustrated by the quotation from [PI21] (Table 4a), with experience, the SSP staff became more accurate in assessing injection frequency. Second, as this quotation also illustrates, SSP clients

learned to better estimate their own drug usage and sterile syringe needs. Enrolling in the SSP may have been the first time some clients needed to accurately assess their usage. As participants reported, not only did they reuse syringes less frequently after enrolling in the SSP but they had not initially realized that they needed a new sterile syringe for every injection.

Our analysis aimed to describe injection behavior change and did not assess in detail information on receipt and linkage to other services provided by the SSP. As many SSPs throughout the US, the Scott County program also provides, among other services, HIV testing and referral to ART and PrEP that could be imperative to reducing HIV transmission among those who continue to share in this high background prevalence setting. In a prospective cohort study among PWID in Vancouver, community HIV viral load was independently associated with HIV incidence <sup>31</sup>, suggesting that reducing HIV viral load through early diagnosis and treatment would substantially reduce transmission. Furthermore, in a clinical trial among PWID in Thailand, PrEP reduced HIV acquisition by 49% (95% CI: 10%-72%), demonstrating the benefits of this prevention intervention among PWID. The Scott County SSP also provides comprehensive overdose prevention that now includes training of clients on administration of naloxone; a model that has been demonstrated to be effective to prevent overdoses <sup>14</sup>. For PWID in resource-limited settings, particularly non-urban jurisdictions, SSPs might be their first (and most familiar) point of contact for harm reduction services. The Scott County SSP offers integrated and comprehensive services in a non-urban setting through strong collaboration and referral between the SSP and local health providers, which could be replicated in other non-urban settings.

Several limitations must be considered in interpreting our findings. First, SSP clients and qualitative study participants may have underreported injection-related risk behaviors due to social desirability, particularly during an emergency outbreak investigation. To mitigate this

potential reporting bias, both the SSP staff and qualitative study interviewers worked closely with the community to establish trust and positive rapport to encourage accurate reporting of risk behaviors. Second, routinely collected program data was limited and did not allow for multivariate analyses; for example, we did not have HIV status information for SSP clients, and therefore, could not examine whether the reported reductions in injection-related behaviors varied by awareness of one's HIV status. Third, we did not have quantitative data on PWID not enrolled in the SSP and therefore, could not directly attribute changes in injection-related behaviors to the SSP; however, several qualitative study participants did not access the SSP and described their experiences. Finally, although the qualitative study employed multiple sampling methods to reach a cross-section of PWID, the experiences of qualitative study participants and SSP clients may not represent the larger PWID population in Scott County or other non-urban settings.

In conclusion, our analysis demonstrated significant rapid reductions of injection-related risk behaviors among PWID following emergency implementation of a comprehensive SSP in a non-urban community in response to the HIV outbreak in Scott County, Indiana. These findings emphasize the need for harm reduction interventions for PWID that include access to syringes and sterile injection equipment, as well as comprehensive HIV prevention services including HIV testing and referrals for PrEP, or care and ART. Future efforts to implement and strengthen non-urban SSPs might consider focusing on retaining existing clients, expanding access to other PWID in the community, including through peer-driven strategies to reach PWID for services, and strengthening referral and follow-up to address evolving health needs to ensure long-term success of such programs. Proactive establishment of SSPs in non-urban communities with PWID might help to prevent future outbreaks of HIV.

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**Table 1. Selected demographic and background characteristics among persons who inject drugs, Indiana, April 4 to September 30, 2015**

	SSP Clients (n=148) n (%)	Interview (n=25) n (%)	Focus Group (n=31) n (%)
<b>Gender)</b>			
Male	83 (56)	14 (56)	15 (48)
Female	65 (44)	11 (44)	16 (52)
<b>Age, (years )</b>			
18-29	49 (33)	10 (40)	6 (21)
30-39	59 (40)	9 (36)	16 (55)
40-49	26 (18)	4 (16)	5 (17)
50+	14 (9)	2 (8)	2(7)
<b>Race/ethnicity</b>			
Non-Hispanic white	138 (98)	25 (100)	29 (100)
Other	3 (2)	0 (0)	0 (0)
<b>Drug injected,<sup>b, c, d</sup> n (%)</b>			
Opana	131 (89)	23 (92)	30 (97)
Heroin	25 (17)	0 (0)	NA
Methamphetamine	0 (0)	2 (8)	NA
Other	4 (3)	0 (0)	1 (3)
<b>Enrolled in SSP, n (%)</b>			
Yes	148 (100)	19 (76)	27 (90)
No	0(0)	6 (24 )	3 (10)
<b>HIV testing, n (%)</b>			
Yes	124 (84)	25 (100)	30 (97)
No	24 (16)	0 (0)	1 (3)
<b>Self-reported hepatitis C status<sup>c</sup> n (%)</b>			
Positive	NA	21 (84)	28 (93)
Negative	NA	4 (16)	2 7)
<b>Self-reported HIV status<sup>c</sup> n (%)</b>			
Positive	NA	10 (40)	17 (59)
Negative	NA	15 (60)	12 (41)

SSP= syringe services program

<sup>a</sup> Information on age was missing for 2 Focus group participants, <sup>b</sup> Drug injected at first visit for SSP clients and primary drug injected in previous 12 months for interview participants; One Opana user in the PIs injected Opana IR (Instant Release); <sup>c</sup> NA indicates that data on this variable was not collected; <sup>d</sup> 3 interview participants were currently not injecting drugs (range 3-11 months of non-injecting). SSP





**Table 2. Differences in self-reported injection risk behaviors and syringe services provided between first and most recent visit among clients enrolled in the Scott County Syringe Services Program Indiana, April 4 to August 30, 2015 (n=148)**

	<b>First visit</b>	<b>Most recent visit</b>	<b>p-value<sup>a</sup></b>
	<b>n (%)</b>	<b>n (%)</b>	<b>n (%)</b>
Sharing syringes to inject drugs	26 (18)	3 (2)	<0.001
Sharing syringes to divide drugs	29 (19)	6 (4)	<0.001
Sharing other injection equipment	36 (24)	7 (5)	<0.001
	<b>Median (IQR)</b>	<b>Median (IQR)</b>	<b>Median (IQR)</b>
Number of times client reported using the same syringe	2 (1-4)	1 (1-1)	<0.001
Injection frequency (times/day) <sup>b</sup>	5 (3-9)	9 (5-15)	<0.001
Number of sterile syringes dispensed	35 (21-60)	63 (35-105)	<0.001
Number of used syringes returned	0 (0-35)	57 (28-105)	<0.001

Note: All variables in this table are self-report by SSP clients collected during each visit, except for number of sterile syringes dispensed and number of used syringes returned which were reported by SSP staff.

IQR=interquartile range; <sup>a</sup> McNemar's chi-square and Wilcoxon signed rank tests were used for comparison of percentages and medians, respectively; <sup>b</sup> Self-reported injection frequency was assessed by SSP staff as a proxy for syringe need. This measure was used by SSP staff to calculate the number of sterile syringes dispensed to each client. Qualitative findings documented that this quantitative change in self-reported injection frequency was not a result of increased drug use over time but rather due to more accurate accounting of syringe needs during start-up of the SSP..

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**Table 3: Sample quotes: injection sharing behaviors before and after implementation of the Scott Country Syringe Services Program, Indiana, April 4 to August 30, 2015**

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*a. Pre SSP - Sharing syringes and/or injection equipment, and sharing syringes to divide drugs*

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Sharing used to be an everyday thing (FG1.4).... The way that some of the people explained to me at the

Community Outreach Center was like when you cook a pill on a can, and you draw it up in your needle [that you already used], we're splitting a pill, and I go to squirt it in his needle, that's the same as sharing (FG1.6).

A lot of people would put bleach in their needles thinking that was going to help but they're just sharing. I take my [used] needle and give it to her [to use] (FG2.12)...They were sharing needles (FG2.13). You use the same water, the same cotton. I didn't even know that was considered sharing (FG2.11)....[Draw up] in one needle, take another needle and put [some in it]. This has got say 100 units in it you put say 30 units in this needle, here you go, shoot that in you [then fill it again and give to the next person...the same needle]. At least 4 people [would share that way] because you ain't going to get much out of four (FG2.13).

I've gotten a \$5.00 needle that I've had a month and 30 people have used it already (FG3.23)...I've seen people get out of their vehicle and not have a needle to use, and grab one out of the ditch line because they're that desperate to use (FG3.16).

I've shared just about everything. We've shared water, spoons and cookers. We've shared needles and cotton... needles were hard to come by...I wanted to get high, and so just we shared it... Depending on what I had I'd try to wash them out. I've washed them out with peroxide, alcohol, bleach, boiling water, I've used a combination of all of those (PI05).

Before the needle exchange started I was sharing needles with people... [If I didn't have a needle, I'd] use their needle. If I didn't have bleach, I'd still use it. [Some have gone] lookin' in a ditch tryin' to find one to use cause they wanted to get high (PI07).

[I've never used a needle twice...but [I shared equipment] We made up on the can, got two pieces of cotton, hers and mine, she put hers on the needle, I put mine on the needle, we both draw it up at the same time and

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she got AIDS, or HIV, whatever, when she put her cotton in there and her needle, and I got it. [Her needle] must have been [dirty]. It went on for five months like that (PI13).

[I usually injected with] my mother. We were both homeless, together... There was a lot of needle sharing going on (PI16).

Before the needle program, people would find needles on the street and use them. They would use the needle until it breaks or stops up. I've seen people keep the same needle for a month and a half and let this person use, and this one, and this one. That's how AIDS come out. Everybody using after everybody. It's the needle family, what we call it... nobody going to let you be sick back before this needle program. They would let you use their needle, and this one, and use it again. That's how. They would let you use their needle [to keep from being sick]. Everybody would use the same [equipment] before. Even the same rig (PI17).

You didn't care [about sharing]. I've seen people say, 'well I've got Hepatitis', and person had known they don't got it. But they're going to use after them, cause that's the only syringe that they can get (PI22).

I'm not going to lie, me and him shared needles before. But, we stayed with his sister last winter, I think that may have been how we missed it. We weren't hanging out over here on this side of town (PI24).

That's why it [HIV] was spreading so bad. They'd pick them up out of the damn ditch line. They didn't care... I don't know how many people, knock on my door and say, hey, you got a rig I can borrow? That's because the needles were so hard to get a hold of. They was gold; if you did get one you better keep it because you didn't know if you was going to get another one. So they reused the old syringes, and share them (PI25).

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*b. Post-SSP harm reduction behaviors to inject and divide drugs*

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You can actually draw up 100 units in one [sterile] syringe, and then divide the 100 units up from that one syringe into multiple different [sterile] syringes. That's how they're sharing [the pill] now. Everybody has their own rig now instead of one rig... as long as you use a brand new syringe to draw it up, and then split it. I've passed on the second shot; you can go ahead and keep that second, because especially if I'm doing a pill with somebody I know that's HIV positive, we use a brand new rig to go ahead and pull up the pill, and we'll split it and then even if they do rinse out their rig, and draw up water and squirt it in the can for the second, you can go ahead and keep that second, because I don't want to take that chance. So I pass on it (FG2.8).

Nobody needs to share a needle; I got a whole box here you know (FG3.21)... I don't share needles, but that don't mean I won't share a pill with you if you cook the pill in clean stuff, pull it all up in one clean rig, and squirt it into two separate rigs (FG3.19). Everybody divides it up, but like he said, you need a clean rig to draw it up and then divide it (FG3.21). There's one person usually pulling it up [in a clean rig] (FG3.20). The new one that never gets used (FG3.15).

I use a new needle every time. I just go ahead and use it, throw it away. Nobody that I run around with now shares needles. They've got the needle exchange now so everybody's got them. So there's no point in everybody using them or reusing them. They just use a new one (FG4.31).

Like now I always make sure nobody's got their syringe in my water. I use alcohol swabs, I use clean needles. Everything's different, just clean completely... And I've been getting those tubes of water, here lately... If they're gonna use they need to have clean water, clean can, clean needles, clean cotton. They don't need to stick their needle in after nobody. They just need to completely be clean about it period. If they see somebody drawin stuff out of their water, throw it away and get new water. That's the only thing that'll save what's left of the rest of the town (PI01).

Nobody ever uses each other's needles since this thing here came around... Anybody that asks me for a clean needle, I give it to them. Cause I don't want to see anyone share dirty needles (PI02).

And I done a quarter with me and my girlfriend... We use separate needles. I used a new needle to draw it all up in and then we split it and she done her shot and I done mine. I would put it in her needle and then put her

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plunger back in it and then she would hit herself and then I hit myself. We got our own water and our own needles. We don't share...we use the little blue bottles or bottled water (PI07).

[I always split a pill with my sister]. Because she's on em, and my mother's on em and not everybody can afford to get their own. So if one of us brings one, usually we share. We always get a new needle. We use a new needle every time, a clean needle. And I'll draw mine up, and then after I draw me 70 units or so, I'll give it to my sister and then I give her the can with the medicine on it and she draws what she wants out of it. She'll get, uh usually about 30 or 40 units. [I split with my mom] the same way. She won't stick her dirty needle in the can. We always use a new one, a new needle, a clean needle always goes in the can. No matter what, a clean needle does (PI09).

We both have clean needles, always. So, I just put my pill in there...[once it's ready I ] draw it up with my needle, that's never been used, and I'll split it [into a new needle] and give some to her (PI15).

I started doing the needle exchange, and me, and my mother started using brand new needles every time... The needle van goes around, and there's a lot of places that they go and drop off needles, so it's not very hard to get a new needle (PI16).

You only use a needle once. You don't use after nobody else. No matter how bad it is, you don't use after nobody else. You don't use the water after nobody else, filter, or none of that. I only use it one time, it goes straight in the can. And I notice everybody's doing that. It's changed totally since the needle program has been out. I ain't seen nobody use after somebody. I won't allow it around me (PI17).

[When dividing the pill for injection] everyone's real clean. They use the same cotton, but they use the same needle they draw it up in that's never touched anything and they squirt it from that needle into each other's needles. So, it's a lot safer now. It's really in town there shouldn't be anymore spreading...There used to be [a cup of water that everyone uses], but everyone that I mess with, we use the back cap, the orange cap. And, we'll dip that down inside the water, and then each person will draw it out of their own cap. That's how we've been doing it to prevent anything (PI21).

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*c. Selective sharing risk behaviors*

There's a lot of people that are HIV positive and they're running around here sharing their needles with people and not telling them they have HIV (FG3.16)... I mean most of the people that are already positive for HIV, they think they can use after somebody who already has HIV and it doesn't make a difference (FG3.18). They feel like they've already got [HIV] and screw it (FG3.15). I'm dead anyway (FG3.19).

Since the HIV hit, I said everybody knows everybody, growing up in this town, sharing pills, shooting dope, whatever man. Since HIV came... I'm worried about protecting my family too, because my wife, she injects now too... She shares with me. So, you know, now I have to worry about sharing with everybody else because she shares with me. I mean if I catch something then I take it home and give it to my wife, so I don't share with anybody else anymore; It's just me and my wife now. We share whatever we got, which is Hepatitis C, among ourselves and not sharing with everybody else anymore, because we don't want their Hepatitis or their HIV. (FG3.21).

Just as soon as we get done with the first one, we work the second one up....And when we get done hitting that, we'll put more water on it, about 80 units of water on it and work it up and then split that [and use the same needle to inject with]. We take the same needle [the new one we each started with for the first shot] and we share water cups. We share the same water cup after we use. We rinse it [the needle] out in the same water. I usually just squirt it on my pants leg. We don't squirt the blood back in the cup. [I squirt it out] about three times, [and then the same needle I just used, goes back into] the can. Then, we would draw it up through the same filter and split it. Well, we keep the can. We clean the can off [by rinsing it], but keep the can sometimes. We throw the filter away...[both of us have HIV/HCV] (PI04).

I'm going to say at the most once [that I've shared a syringe since being in the needle exchange]. Because I didn't have one, and I had already found out that I had HIV. I [shared with] a male. We both already knew that we both had it. I'm pretty sure he said 'do you have a needle', and I said 'no', he said 'go ahead and use mine, we both got it anyway', and used it (PI16).

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**Table 4 – Sample quotes: injection frequency per-day<sup>a</sup> and syringe disposal before and after implementation of the Scott County Syringe Services Program, Indiana, April 4 to August 30, 2015**

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*a. Current injection frequency*

If you don't do enough Opana, then in a couple hours, you feel really bad again and [have to inject]. Inject 6,7,8 times but it only like small amounts (PI02).

Me and the lady [syringe exchange program counselor] had a miscommunication. She was like, 'how many time do you do a pill a day?' And, I was like 'well, 5 or 6'. She was thinking 5 or 6 times I'd stick myself. And, see she didn't ask me how many times I stick myself. She asked me how many pills I do a day. And, so that worked out a lot different when she figured, you know, ok 5 times 7 is 35 rigs. You know, 35 needles (PI21).

Right now... there's three of us that will split a quarter. I would probably inject about 10 times a day. When you're sharing you want to inject more because when they're not in my house I inject probably 4 times a day because I'm getting that whole quarter to myself (PI03).

[I inject it] every day. Sometimes three or four times (PI04).

I inject Opana and crystal meth<sup>b</sup>, Opana on a daily basis, meth once every two weeks (PI07).

I used Opana and heroin yesterday [and injected each] separately (PI08).

[I inject] Opana maybe two to three times a day (PI09).

I inject three-quarters of a pill [each separately] per 24 hours ... I've been [injecting] this past year a lot more.

But it's not caused by the HIV outbreak. It's just for the fact that I've only been using for two years and every year that you use, the more that you're going to want to use or need to use (PI10).

I probably shoot meth like once a day, but I rarely do meth (PI11).

I'd use a needle four or five times a day (PI14).

I've been trying to get off them so I've only been doing it like once a day for the past month (PI15).

[I inject] between two to four times a day. I would do a quarter of one. So about a whole pill a day (PI16).

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All I use is Opana. I inject it about six times a day [from the time I wake up until the time I go to bed] (PI17).

I inject twice a day (PI19).

I'll buy a quarter and me, you, and the other guy [share a pill] and that happens six-seven times a day (PI21).

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***b. Syringe disposal before and after the SSP – using containers and cleaner communities***

I think [it's] just cleaner; everybody can have their own. Before they were everywhere, now you don't have to keep your needles, you can throw them away (FG1.6); They was everywhere. You could not look anywhere and not see a cap, or a plunger, or a whole [needle] laying out there, but it's really not like that now since [the SSP] has been going on. Not as many on the street or in the ditch (FG1.7); Things are a hell of a lot cleaner since this program started. We're just giving them back. [We] are bringing in more used needles [than are] getting handed out. I was passing a guy's home and found a syringe in a yard... I picked it up off the yard and I put it in my box...I would just turn some back more than I usually have. I think it's you're bringing them more off the streets than you are putting them out (FG1.2)

If they ain't got the needle to use, we'll give them a needle out of ours that we get from [the SSP], and then they'll put it in the bucket. Or if I'm going to do a pill, I'm going to take my needle with me and I'm going to put it in their container. I don't always have the exact needles that they give me because [containers are] everywhere. I put them in whoever's container; but they don't go on the ground [like before the SSP] (FG3.17). Throw them in that box, you know, that way you ain't got to pack them around or throw them down in the ditch [like we did before the SSP]. Dispose it in my little red box (FG3.21).

They're not finding dirty needles laying on the streets. People have containers to put them in. People aren't scared to walk down the road with a needle, so they're not throwing them down. It's a good thing (PI03).

[Before the SSP] I'd break the end of it off, the point, put the cap on it and throw it in the trash, or [put it in] a pop can and smash the pop can, sometimes I'd do that so a kid wouldn't get it or something... [Now, I] Put a cap on it and put it in one of them exchange containers (PI04).

[When I'm done I] throw it away. We usually put them in one of the boxes (PI08).

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I would shoot it up, and then I would after we was all done I'd throw it away. I have sharpies containers I always put it in [I'm a diabetic] (PI12).

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*c. Some unsafe disposal may occur post-SSP*

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Myself, I still, when I'm out walking around, I find needles. I pick them up and throw them away, I don't understand why they throw them down (FG2.13).

I disagree with the needle exchange. 55,000 needles and only 37% came back in, now that other 20,000 rigs that didn't come back in winds up in my yard?!... I've got four kids...They run around barefooted and [finds] rigs out of my garden, cook cans in my garden, and my woodpile...the ones that's not getting returned, they wind up in my yard. Used to be you found them in your yard anyway, but now I'm finding them in my yard twice as bad, ten times worse now (FG3.21)...Yeah, but we're trying to keep them to not throw shit down, but there are a few people that's throwing them down instead of taking them and turning them in (FG3.20).

You can actually walk now, and you might still see needles, but not nearly as many as it was before (PI03).

[People] are not finding [needles] laying on the streets like they used to and I don't pick up quite as many as I used to. I pick them up when I see them (PI13).

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SSP=syringe services program; PI=private interview; FG=focus group

<sup>a</sup>. Injection frequency quotes refer to the number of injection episodes throughout the day. In any given episode, the participant may have injected more than once. These quotes do not reflect those practices of injecting more than once per episode.

<sup>b</sup>. Methamphetamine

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**Table 5: Sample quotes: reusing the same syringe to inject before and after implementation of the Scott Country Syringe Services Program, Indiana, April 4 to August 30, 2015**

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***a. Pre-SSP reusing the same syringe multiple times***

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Before, they would use [needles] 6-7 days at a time (FG3.15). A month at a time (FG3.18). It would be like using a fishhook (FG3.16).

We had to use needles so long that their numbers were worn off. The plungers are broke in them (PI02).

Before the needle exchange I would hang on to a needle that needle was my life. [I'd keep it] like a week but I'd clean it out with bleach every time I use it (PI07).

They would sell them for five bucks a piece on the street. Then you use the same one three, four times. Honestly I've used the same one until it just broke on me. I mean I remember having one for almost a month (PI09).

My needles were normally new. Sometimes were used a couple of times by myself, but that's it (PI10).

Man, I kept a rig for 3 weeks before. Took an emery board and would fuckin' sharpen it (PI18).

About the most thing I do is reuse a rig if I have to. I'll only reuse them for a while or they're pretty dull (PI20).

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***b. Post-SSP no longer reusing the same syringe***

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They're not reusing [the same syringe anymore], not doing the same line over and over (FG1.3). Not resharpening them (FG1.2). Or pull it back and your plunger's broke (FG1.6).

[So now] I might have one needle one time, throw it away, you don't need to use it twice (FG2.13). [Yeah we] don't use the same one twice, because I mean we have clean needles now (FG2.11).

Nobody ever uses the same needle no more. They go straight to the container (FG3.23).

Most people are with the needle exchange program, and most people do one shot and then they throw that needle away in a secured container, and they're not using one needle for two or three days at a time (PI03).

The [shot] I save, it's brand new it's never been used. Cause once I use it I put it in that red box and then it never gets used again. I'm very cautious. I try to be very clean (PI07).

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There's more pill on the bottom...There's still another rinse on there...You just draw it back up and, do it [with a sterile syringe, no longer need to reuse a syringe] (PI11).

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*c. Post-SSP occasionally reusing the same syringe*

Yeah, cause we missed that day [the SSP] - that's another week we have to go using used syringes (FG4.28).

But I have used, used ones because the newness [of the new ones] makes it go in and out too easy. I like using a needle that's been used two or three times, not by someone else [though, just me] (FG4.29).

I have reused a syringe. Just couldn't find any clean ones, didn't know where my friend was to get me one, and I just used an old one (PI04).

Now, the most I'll use a needle is maybe twice. I'll use the same needle per session. So, I'll do my shot, and washes, I'll probably do with the same needle, and then I'll throw it away (PI05).

Sometimes I can't get to the SSP, and so it will take two weeks before I'll get back in here. So I will use my needles again. But I usually clean them out real good and then I'll use them again (PI10).

As long as I got a couple new rigs I will reuse those 3 rigs, like, 4 or 5 times (PI18).